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THE BOTTOM LINE

In the presence of the right policies and investment climate, private sector participation in transmission systems can improve the security, reliability, and quality of supply in a cost-effective manner. Ample lessons exist for replication. Strong, independent regulatory institutions are critical. Such institutions should be equipped to develop detailed expansion plans that make it possible to identify and select projects. But the government must be willing to see reforms through. Partial or incomplete reforms can be expensive and ineffective. Of paramount importance is a commitment to cost-based pricing.

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Private Sector Participation in Transmission Systems: Making It Work

Why is this issue important?

In many developing countries, power transmission systems are a bottleneck to expansion of electricity service

Power grids require regular investments to meet growing demand, maintain service reliability, and meet the international goals of universal access and a doubling of renewable-energy capacity. In many countries power generation markets have been liberalized to attract private investment, but congestion in transmission lines, which have remained largely public, constrains the power trade and frustrates competition. The investments needed to relieve that congestion may not be readily available from public sources.

The private sector can be a strategic partner in building and maintaining transmission networks, depending on how well its participation is structured to achieve the desired outcomes. Experience in several countries, especially in Latin America, shows that private participation can improve transmission service and reduce costs.

Power utilities in the Republic of Korea, Singapore, and Taiwan, China, demonstrate that state-owned utilities can operate at high standards of efficiency and management, although many do not. At the same time, the interests of private owners create an incentive for maximizing efficiency, an incentive markedly different from the vote-winning and rent-seeking interests of politicians and bureaucrats (Besant-Jones 2006). But, in challenging legal and institutional environments, is it possible to entice private companies to invest in transmission infrastructure?

The short answer is yes. Between 1994 and 2013, the private sector, particularly in Latin America, invested nearly $27 billion in transmission infrastructure in low- and middle-income countries, accounting for 78 percent of total costs of the projects in which it was involved.[1] Of the $27 billion, $12 billion was raised in Brazil (2000–13). The concentration of activity in Latin America makes sense, as utilities in most of the countries of the region had recently undergone at least some power sector reforms and restructuring.

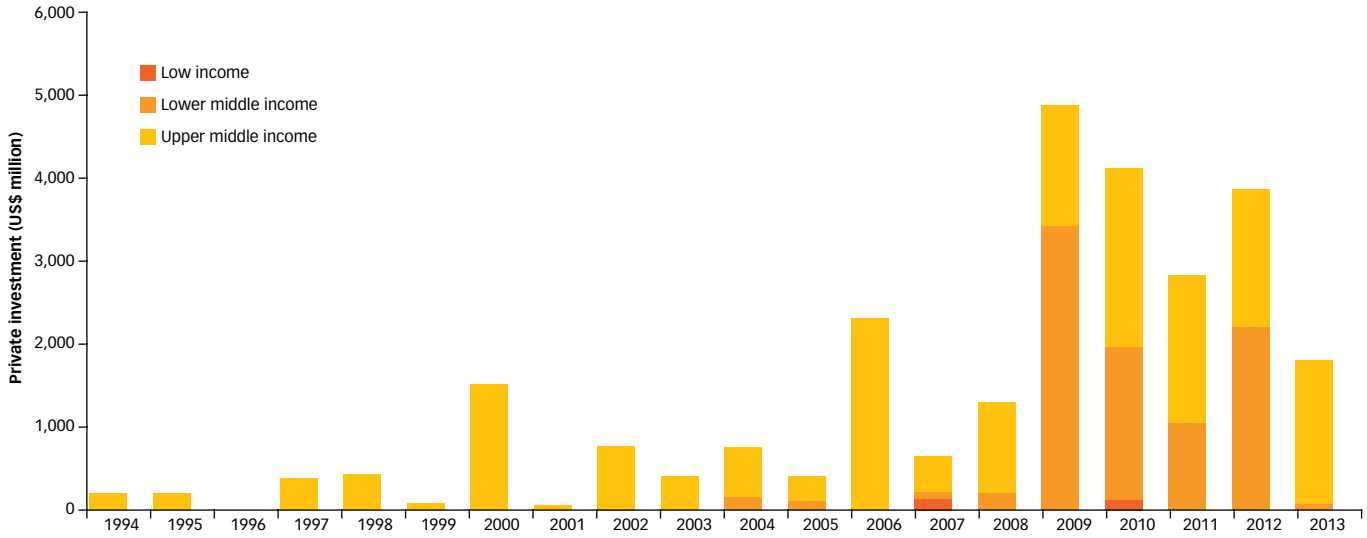
In Peru, private sector participation has driven down both investment and operation and maintenance (O&M) costs. In a sample of 15 projects, winning bids were, on average, 36 percent lower than estimated annual costs (which also set the price cap). In the extreme case, the winning bid for the Carhuamayo–Paragsha–Conococha–Huallanca–Cajamarca–Cerro Corona–Carhuaquero line was 58 percent lower than the estimated annual cost (table 1).

Upper-middle-income countries account for about 65 percent of the private capital raised for investment in transmission infrastructure between 1994 and 2013 (figure 1). A threshold for private sector entry is formed by a combination of system size and per capita income (Besant-Jones 2006).[2] A large group of middle-income

1. According to the Private Participation in Infrastructure (PPI) Project Database, managed by the World Bank and the Public-Private Infrastructure Advisory Facility (http://ppi.worldbank.org). The database records contractual arrangements in which private parties assume operating risks in low- and middle-income countries. Some of these projects are public-private partnerships.

2. Besant-Jones argues that country income level has more influence than system size on the roles of the public and private sectors and on access to electricity services, whereas system size has more influence on market structure. When countries such as Peru opened up their grid to private investment, the grid was weak and in dire need of capital (World Bank 2012). India's first experience with private participation in transmission infrastructure came when India was still classified as a low-income country. Bearing out Besant-Jones's thesis, Cambodia is the only low-income country with more than one such transaction.

Figure 1. Distribution of private sector investments in transmission infrastructure by country income levels, 1994–2013



Source: World Bank Private Participation in Infrastructure (PPI) Project Database.

"Proposals to reform the power are often met with the argument that power supply is a strategic matter or a social service that should be controlled by the state."

countries meets these threshold values with systems larger than a thousand megawatts and national per capita income above US$900; a small group of low-income countries falls below the threshold . About two-thirds of developing countries fall into these two groups.

What have been the obstacles to private participation?

Old arguments for exclusive public ownership of transmission lines have faded only slowly

Proposals to reform the power are often met with the argument that power supply is a strategic matter or a social service that should be controlled by the state. To cite one example, before sector reforms in Peru, it was illegal to disclose maps showing transmission lines—for reasons of national security. Similar sentiments are often expressed with regard to water supply, roads, and other infrastructure.

Another argument advanced for keeping transmission networks in government hands is that they are essential for system optimization. Over the years, this argument has proven unconvincing, provided the asset owner relinquishes control over dispatch to an independent service operator.

State control of the transmission network is sometimes justified on grounds that power is a natural monopoly and therefore best managed by the public sector. Although it is true that the operation of transmission grids, by their nature, cannot be competitive, this does not preclude the private sector from investing in transmission infrastructure, although the approach must differ from that taken in the case of private participation in generation. Many developing countries do not meet the conditions necessary for attracting substantial amounts of private investment, but the case for private sector participation rests on how well it would achieve desired reform outcomes under prevailing operating conditions (Besant-Jones 2006).

"Where the incentives are right, private sector participation can reduce operating costs, technical losses, theft of service, and price levels while improving availability and quality of service compared with state-owned or privately regulated, vertically integrated monopolies."

Table 1. Cost estimates and winning bids of public-private transmission projects in Peru, 1998–2013

Year of award	Project	Length of line (km)	Capacity (MVA)	Capital investment (US$ million)	Annual transmission cost (US$ millions)		Winning bid as fraction of cost estimate (%)
					Winning bid	Cost estimate (price cap)	
1998	Mantaro–Socabaya	700	300	179.0	27.6	42.6	35
1999	Southern electric transmission system reinforcement	444	180	74.5	11.5	14.3	19
2008	Eléctrica Carhuamayo–Paragsha–Conococha–Huallanca–Cajamarca–Cerro Corona–Carhuaquero	696	360	106.1	10.0	42.6	58
2008	Eléctrica Mantaro–Caravelí–Montalvo and Machu Picchu Cotaruse	200	350	35.7	5.4	5.6	4
2008	Chilca–La Planicie–Zapallal	94	1,400	52.2	8.1	14.5	45
2009	Zapallal–Trujillo	530	1,000	167.5	25.8	32.0	19
2010	Chilca–Marcona–Montalvo	872	700	291.0	48.2	61.6	22
2010	Tintaya–Socabaya and associated substations	207	400	43.6	6.7	12.3	46
2010	Talara–Piura	102	—	14.6	2.3	2.5	9
2010	L.T. Machupicchu–Abancay–Cotaruse	204	500	62.5	9.8	14.2	31
2011	Trujillo –Chiclayo	325	—	101.4	15.6	15.8	1
2012	Carhuaquero–Cajamarca Norte–Cáclic –Moyobamba	402	450	106.9	16.2	22.2	27
2013	Machupicchu –Quencoro –Onocora–Tintaya and associated substations	356	354	114.3	16.7	28.5	41
2013	Mantaro–Marcona–Socabaya–Montalvo and associated substations	900	—	278.0	41.4	63.5	35

Note: MVA = megavolt amperes; O&M = operations and maintenance.

Using Peru as an example again, before the transmission sector was opened to the private sector there, electricity users were already paying cost-reflective tariffs (World Bank 2012).

Yet another objection to private involvement in transmission infrastructure is that private participation increases the cost of service to the end-user. Here, too, experience suggests otherwise, as long as private participation is designed and pursued with adequate incentives. Where the incentives are right, private sector participation can reduce operating costs, technical losses, theft of service, and price levels while improving availability and quality of service compared with state-owned or privately regulated vertically integrated monopolies (Joskow 2008; World Bank 2012; IEA 2005).

What forms does private participation in transmission infrastructure take?

A wide variety of models exists to suit national circumstances

Private participation in transmission infrastructure can take many forms, varying in terms of ownership of assets, assumption of risk, responsibility for investment, and duration of contracts. Ownership models tend to be long term to allow investors to recoup investments at set tariff levels and to transfer risks and responsibilities to the private sector. In the concession model, the private investor

"Independent regulatory institutions and strong legal systems are required to enforce legal and policy requirements, minimize political influence, and promote fairness."

runs the business but does not own the infrastructure assets. In other cases, the private investor runs the business and owns the infrastructure assets. These conditions apply to both existing and new transmission infrastructure. The variety in investment forms is apparent in the names by which the corresponding contracts are known: build-lease-transfer (BLT), build-own-operate (BOO), build-operate-transfer (BOT), build-own-operate-transfer (BOOT), build-rehabilitate-operate-transfer (BROT), rehabilitate-operate-transfer (ROT), build-transfer-operate (BTO), or a mix (UNESCAP 2011; World Bank 2015). Projects identified in transmission master plans are awarded through competitive selection.

Peru, for example, transferred provisional ownership of some transmission facilities through ROT contracts but favored BOOT contracts for new transmission lines, as did Argentina, Brazil, Chile, India, and Zambia. The steps of a typical BOOT model, as used in Peru, are described in box 1.

Project revenues are paid by clients (generators, large consumers, and distribution utilities) in proportion to their energy consumption and time of maximum demand, thus introducing an incentive among consumers to switch their consumption from peak hours. Project risks are borne by the transmission project; market risks, by the whole system. The model has been effective in attracting investment from the global capital market (World Bank 2012).

Box 1. Steps in the BOOT transmission model implemented in Peru

1. Every second year, the system operator prepares a transmission expansion plan based on least-cost, multi-attribute criteria.
2. Transmission projects that are part of the "guaranteed system" undergo international bidding.
3. The bidder with the lowest guaranteed annual return is selected.
4. The BOOT contract guarantees the winner bidder's revenue requirements for a 30-year period.

Source: World Bank 2012.

What has to be done to attract private investment?

Success depends on a strong and independent regulator, the right investment climate, and good planning

Regulations. Any reform designed to attract private sector investment depends on the existence of a sound legal and policy framework.

Independent regulatory institutions and strong legal systems are required to enforce legal and policy requirements, minimize political influence, and promote fairness. Unless the regulator has sufficient autonomy to carry out its duties, and in the absence of transparency in procedures and processes, investors quickly lose confidence in the credibility of reforms. The damaged trust is difficult and expensive to repair (Besant-Jones 2006). In fact, restoring investor confidence after a breach of rules, regulations, and trust can be harder than starting the reform process, because such conduct sets a precedent that is not easily ignored.

The legal and regulatory framework for how the power sector will operate should be put in place before attempts to elicit private interest begin. It should strike a balance between rigor and ease of implementation. A regulatory framework that is too onerous may deter new investment by making regulatory requirements too costly for investors.

Regulations should be closely monitored and adjusted in response to system conditions. Interviewees in Peru admitted that, although reforms had been largely beneficial, they had been performed with excessive optimism and without a full understanding of the implications of adopting, with only minor modifications, a Chilean model that had yet to be tested. The initial set of reforms was therefore followed by a round of corrections. Growing concentration in ownership in the sector caused by a set of mergers made it necessary to adopt an antitrust law to reduce the risk of vertical reintegration and restricted competition. While regular reforms are necessary to take corrective action, change comes at a cost that needs to be balanced with the benefits.

"Liberalization is a long process rather than a single event; it requires an ongoing commitment by the government to resolve challenges when vested interests and cross-subsidies are exposed."

Poor pricing and cost-allocation mechanisms can undermine the reform process. Electricity tariffs should be designed for full cost recovery and sustainability. Regulations can also be used to provide incentives for improving operating conditions.

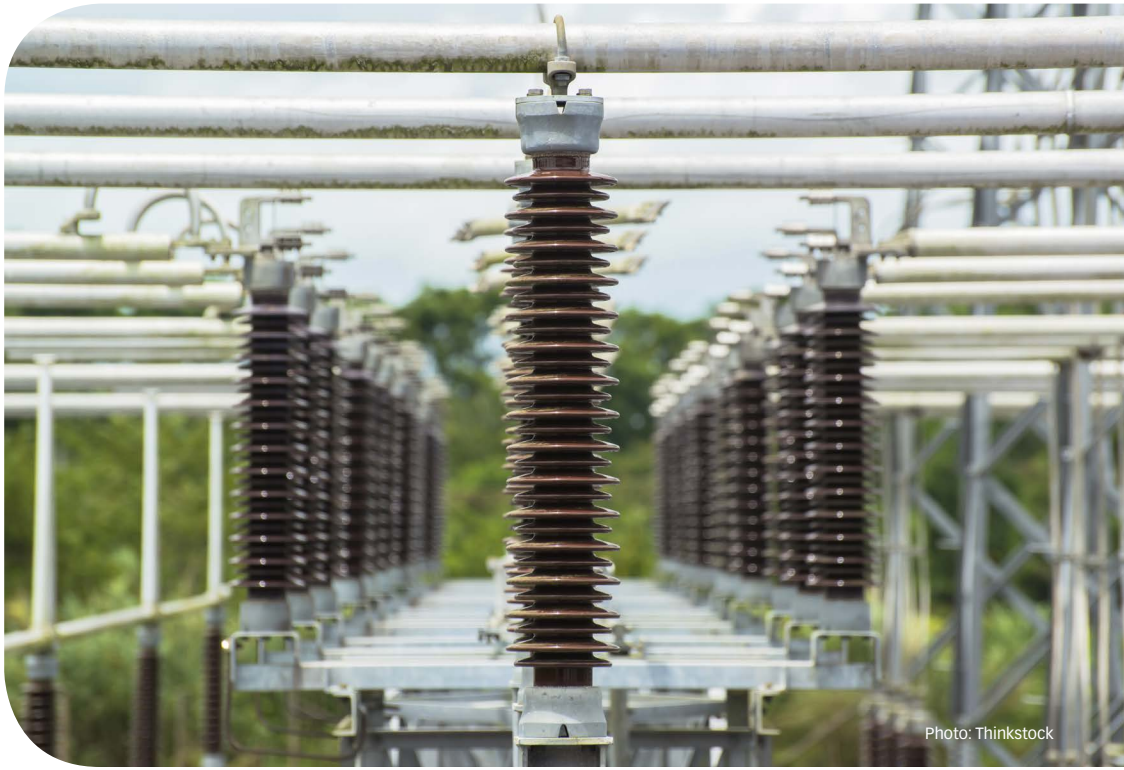
Investment climate. Perhaps the most important element to foster a positive investment climate is the political will to sustain reform efforts and policies. Liberalization is a long process rather than a single event; it requires an ongoing commitment by the government to resolve challenges when vested interests and cross-subsidies are exposed (IEA 2005). Valuing predictable conditions to manage risks and avoid threats to investment returns, private investors attach great importance to stability and adherence to laws and contracts. For that reason, a credible regulatory system requires more than a new regulatory body. Effective commercialization of the transmission system cannot be achieved even under private ownership if politicians continue to interfere in procedures (Besant-Jones 2006).

Extending beyond the power sector, a stable macroeconomic environment (including low inflation), sound taxation policies, access to foreign exchange, and fiscal prudence, are important for attracting private investment (Besant-Jones 2006).

Even after reforms are introduced, early investors may need additional assurances or incentives to cover perceived risks. In Kenya, where reforms did not provoke sufficient interest in the private sector, guarantees from the World Bank Group and direct capital injections from the International Finance Corporation were needed to boost investor confidence.

Under a new and untested regulatory regime, specific contractual arrangements may be needed to provide stability and credibility for private investors (Besant-Jones 2006), especially in countries where reforms have been halting or where earlier reforms have been reversed. The additional measures needed to attract private investment may include arrangements in which the government shares risk with private investors until the preconditions for viability are met.

Planning. A centralized planning process is required to ensure that only lines that lead to least-cost expansion are selected for implementation by the private sector. In Peru poor planning resulted in the development of a radial transmission system that raised risks of congestion, did not promote energy efficiency, failed to contribute to regional energy integration, and failed to improve one of the lowest rates of access to electricity in rural Latin America. The planning process should identify cost-effective projects in a



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transparent manner, thereby increasing the credibility of the regulatory framework (World Bank 2012).

Planning for power system expansion should be proactive, transparent, and based on solid forecasting and analysis. Given the gestation period of projects, planning should be done in advance, so that the transmission network keeps up with growing demand and new capacity. Projects must be executed in line with the schedules proposed in the expansion plan. Procurement and licensing processes must not be allowed to cause delays.

Right-of-way acquisition and permitting and licensing processes can discourage the private sector from implementing projects. In Peru disputes over development of transmission lines and other infrastructure have stalled several major projects, jeopardizing system security and reliability. Developers there are responsible for obtaining social and environmental licenses, but this function could be better performed by the public entity.

Restructuring and reforms should factor in possible loss of jobs. On average, state-operated utilities employ more people than privately run ones to produce the same level of output, as exemplified in Peru (World Bank 2012). Gains in labor productivity following the introduction of the private sector are usually linked to a reduction in staff (Gassner, Popov, and Pushak 2009). Policy makers need to weigh the tradeoff between an increase in output and service quality and a reduction in staff, keeping in mind that staff reductions can occur over several years and are usually small relative to the national labor force.

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